

**TFM**



**Traffic Flow & Enterprise Management**  
**Integrated Product Team**

**FAA**  
**AUA-700**

# **TFM System Description**

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<http://www.faa.gov/aua/aua700>

**Traffic Flow & Enterprise Management**



# ***Traffic Flow Management***

## **Goal:**

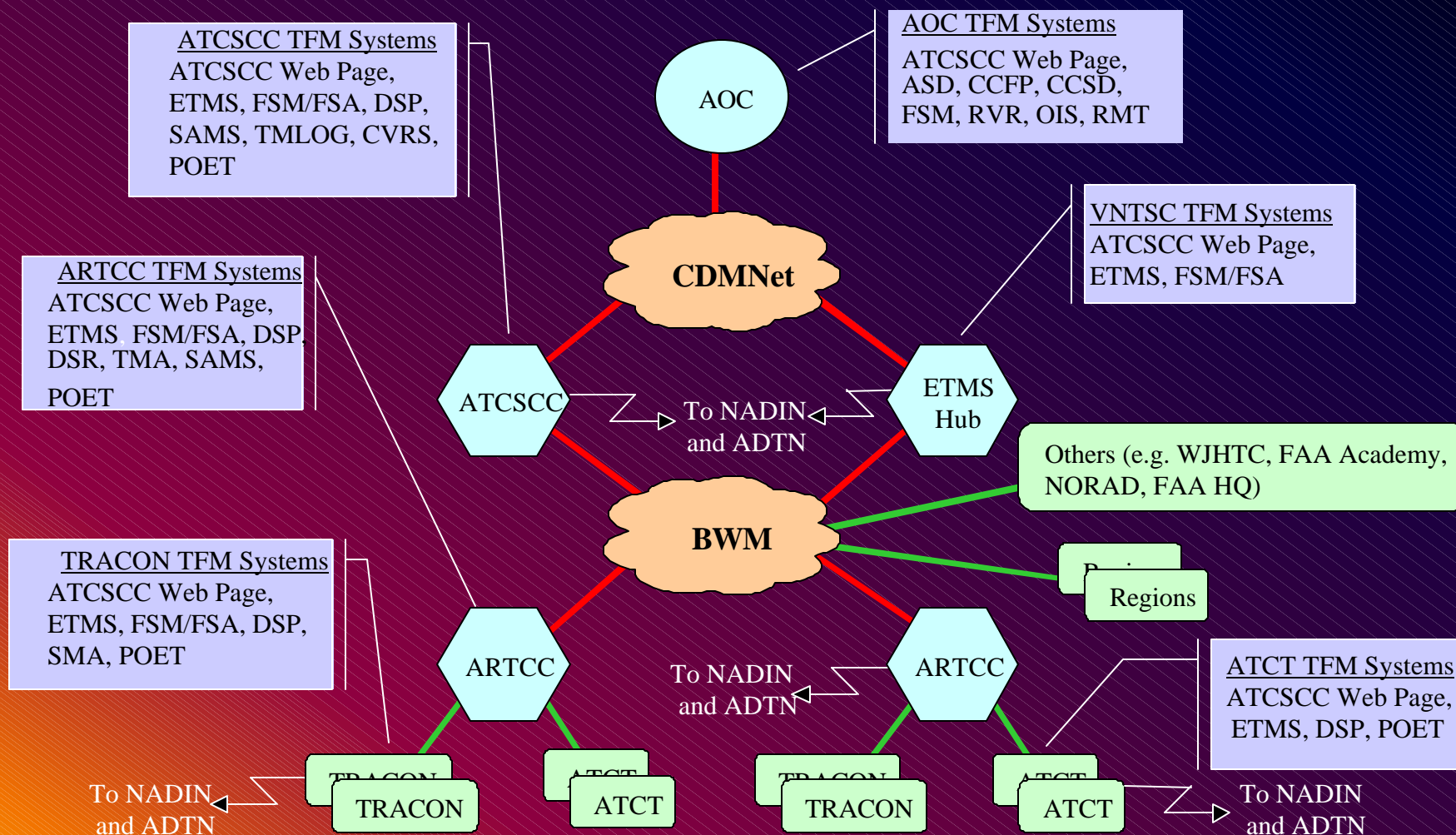
- Provide strategic planning and management of air traffic demand to ensure smooth and efficient traffic flow through FAA-controlled airspace

## **Air Traffic Control System Command Center**

- Centralized manager for TFM capabilities
  - = Collateral TFM functionality and responsibilities distributed to traffic management units at ARTCCs, TRACONs and Towers
- Traffic management coordinators at these various facilities employ a combination of automated decision support tools and procedures



# TFM Communications



TFM Functional Architecture Diagram  
 (Draft Functional Audit Report 9/27/2002)





# Core Systems & Interfaces

## TFM SYSTEMS

ETMS

FSM

FSA

POET

RMT

TM Log

ESIS

National Playbook

STMP

DSP

## EXTERNAL INTERFACES

HOST

ARTS

STARS

AOCs

NORAD

DOTS

NWS

OpsNet

NOTAMS

ERIDS

SAIDS

WARP

ITWS

DSR

TMA

ODAPS

OCS

EARTS

ARINC

NADIN

OFDPS

WSI

CCFPNWS

OAG

NGRVR

ACES

NFDC

NOS

ASDI



# Infrastructure

## SOFTWARE

HP/UX

Solaris

Windows

Linux

Oracle

Access

## HARDWARE

HP

SGI

PCs

## NETWORKS

BWM

NADIN

ADTN 2000

CDMnet

Internet



**ETMS**

## Enhanced Traffic Management System

- Core of the TFM infrastructure
- Supports and integrates an array of software tools that provide common situational awareness of current and forecast NAS conditions
- Distributes planning among major NAS users and managers
- Provides performance analysis of traffic management operations to identify and resolve problems in the NAS and identify areas for improvement





## ***ETMS Evolution***

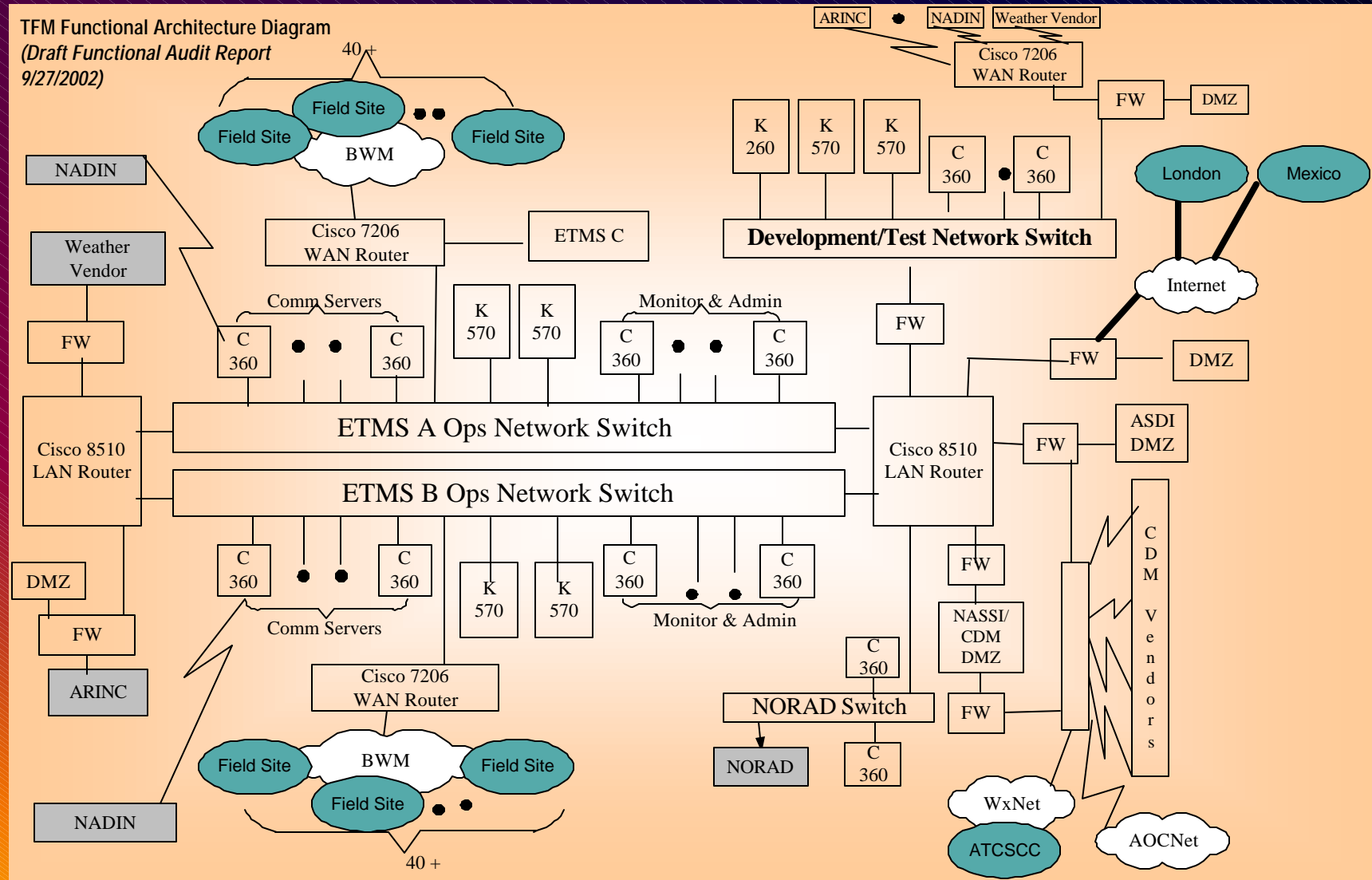
- Mid-1980s: ETMS developed as prototype by Volpe National Transportation Systems Center
- 1988-1992: Operational ETMS fielded on Apollo workstations at ATCSCC, ARTCCs & TRACONs
- 1994: Apollo workstations replaced with HP 9000/433s
- 1994: ETMS software converted from Pascal to C
- 1995: CDM initiated
- 1998: ETMS Y2K assessment
- 1999: Y2K-compliant software and new HP C360s deployed
- 1999-Present: TFM systems added

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# ETMS Network

TFM Functional Architecture Diagram  
(Draft Functional Audit Report  
9/27/2002)







## ***Key TFM Functions***

- Enhanced Data Exchange
- Improved Arrival/Departure Management
- Improved Congestion Management
- System Impact Assessment
- Performance Assessment



# ***Enhanced Data Exchange***

- Provides common situational awareness of NAS operations through the established CDMnet to FAA and NAS users





# ***Enhanced Data Exchange***

## Enhanced Data Exchange Tools

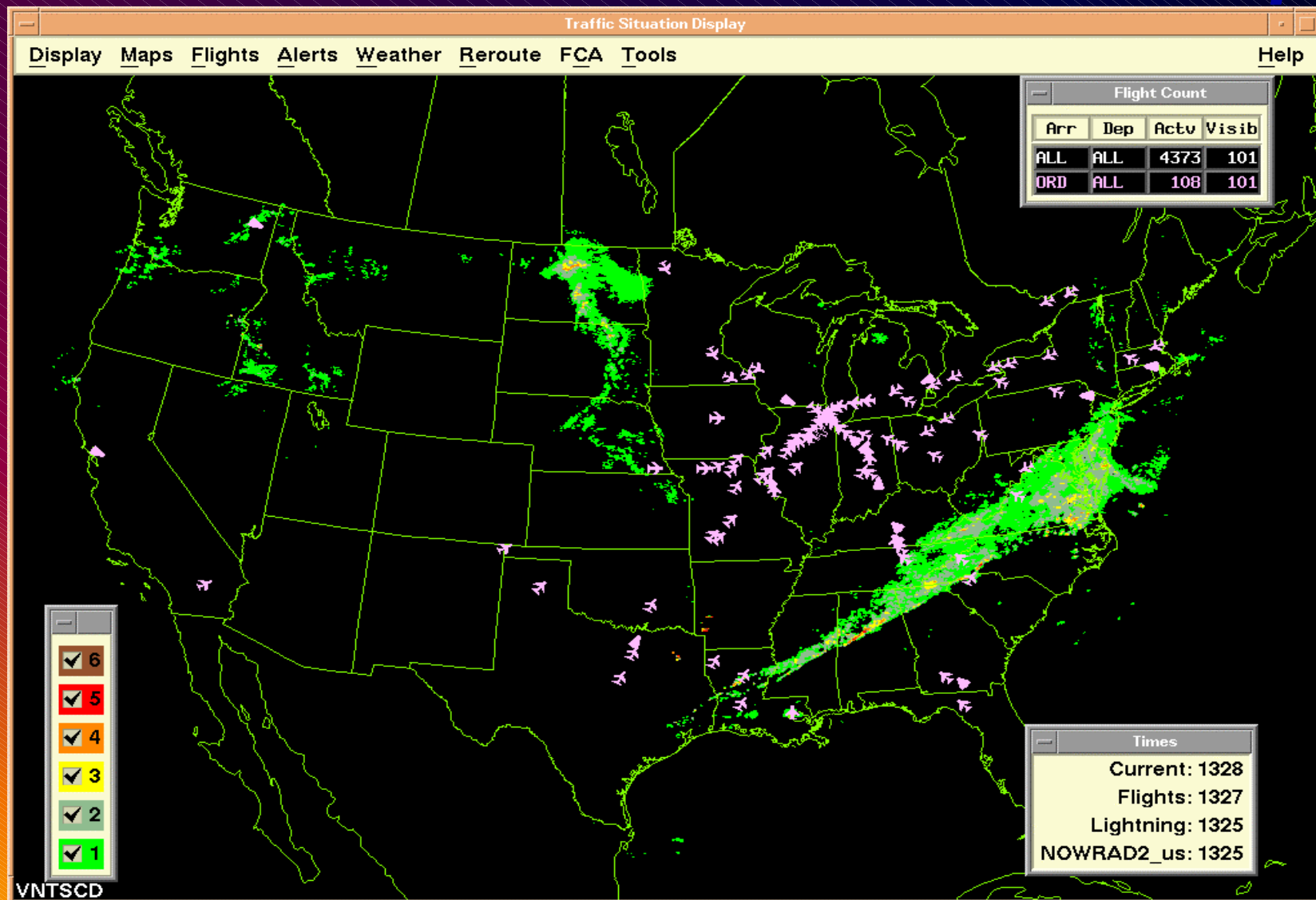
- **Traffic Situation Display**
  - = Current aircraft positions graphically displayed on maps with geographical boundaries
  - = Traffic viewed in variety of modes
    - ✓ Nationwide
    - ✓ Regional
    - ✓ Local airport
  - = Displays weather features affecting air traffic



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# Traffic Situation Display





# ***Enhanced Data Exchange***

## Enhanced Data Exchange Tools (Cont'd)

- Web-Based Situation Display (WSD)
- Common Constraint Situation Display (CCSD)
- Runway Visual Range (RVR)
- Collaborative Convective Forecast Product (CCFP)
- Diversion Recovery Web Page (DRWP)
- Enhanced Status Information System (ESIS)
- TM Log



# Improved Arrival/Departure Mgmt.

- Technology and procedures enable FAA and NAS Users to optimize the airport operation for both arrivals and departures







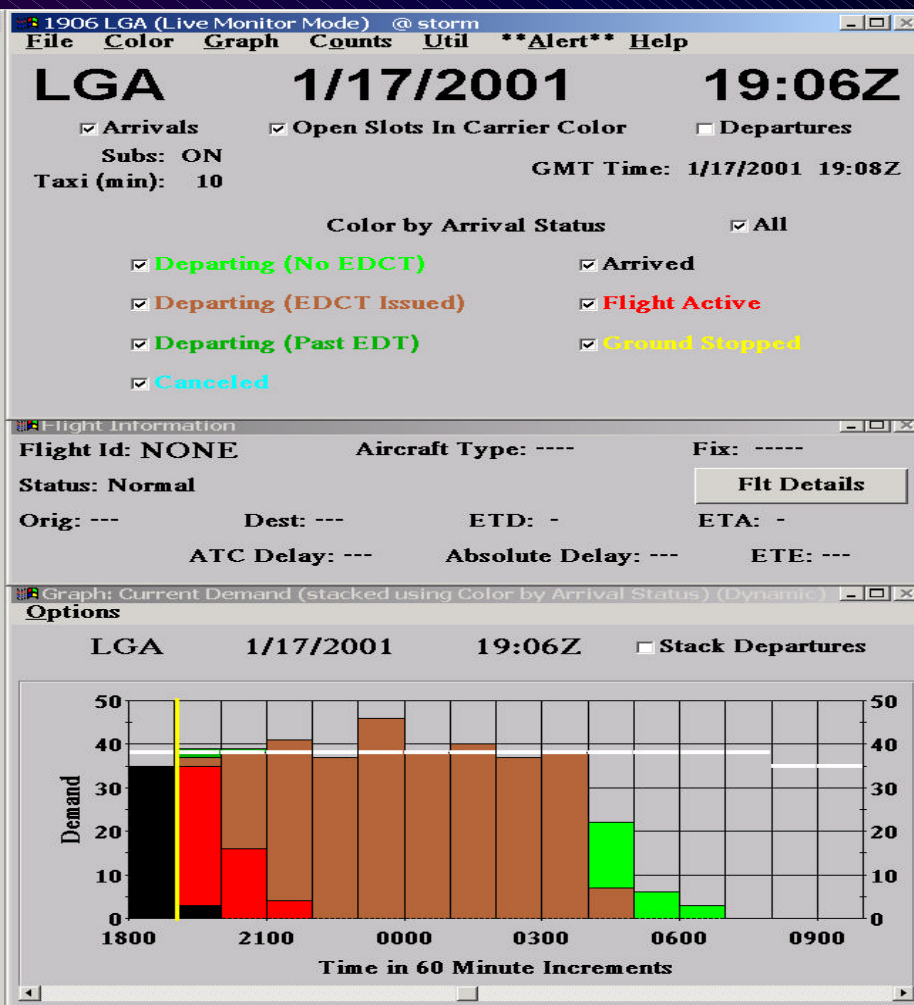
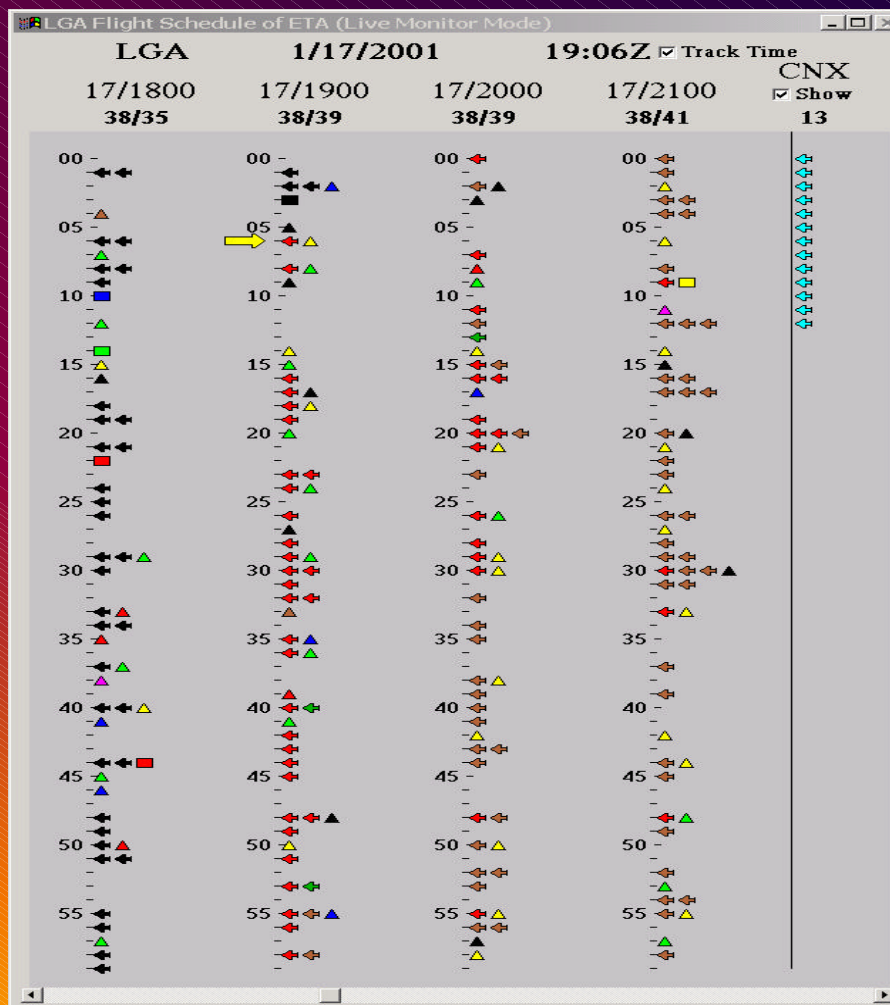
## ***Improved Arrival/Departure Mgmt.***

### Arrival/Departure Management Tools

- Flight Schedule Monitor (FSM)
  - Allows AOCs & ATCSCC to view graphical and timeline displays of airport capacity and demand
  - Includes several rationing schemes that try to balance capacity and demand efficiently and equitably
  - Runs on NT-based platform independent of ETMS



# Flight Schedule Monitor





## ***Improved Arrival/Departure Mgmt.***

### Arrival/Departure Management Tools (Cont'd)

- Ground Delay Programs (GDPs)
- Flight Schedule Analyzer (FSA)
- Airport Demand Chart (ADC)
- Departure Spacing Program (DSP)

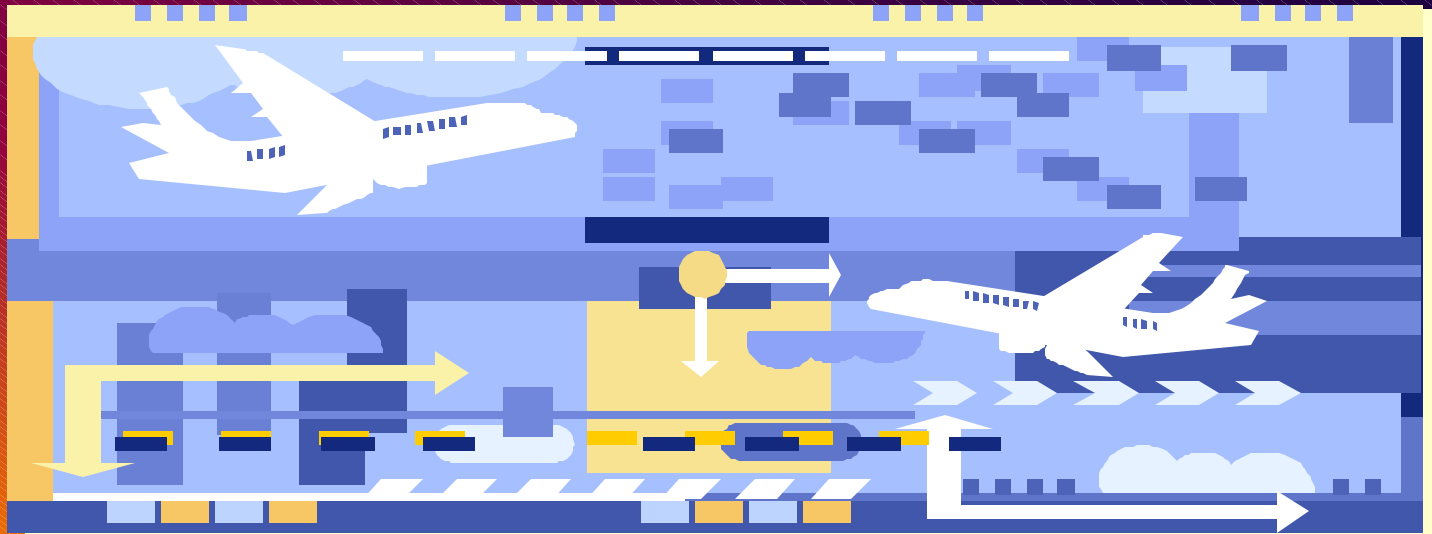


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## *Improved Congestion Management*

- Provides ability to forecast airspace congestion, measure and communicate forecast uncertainty, and execute planned TFM initiatives





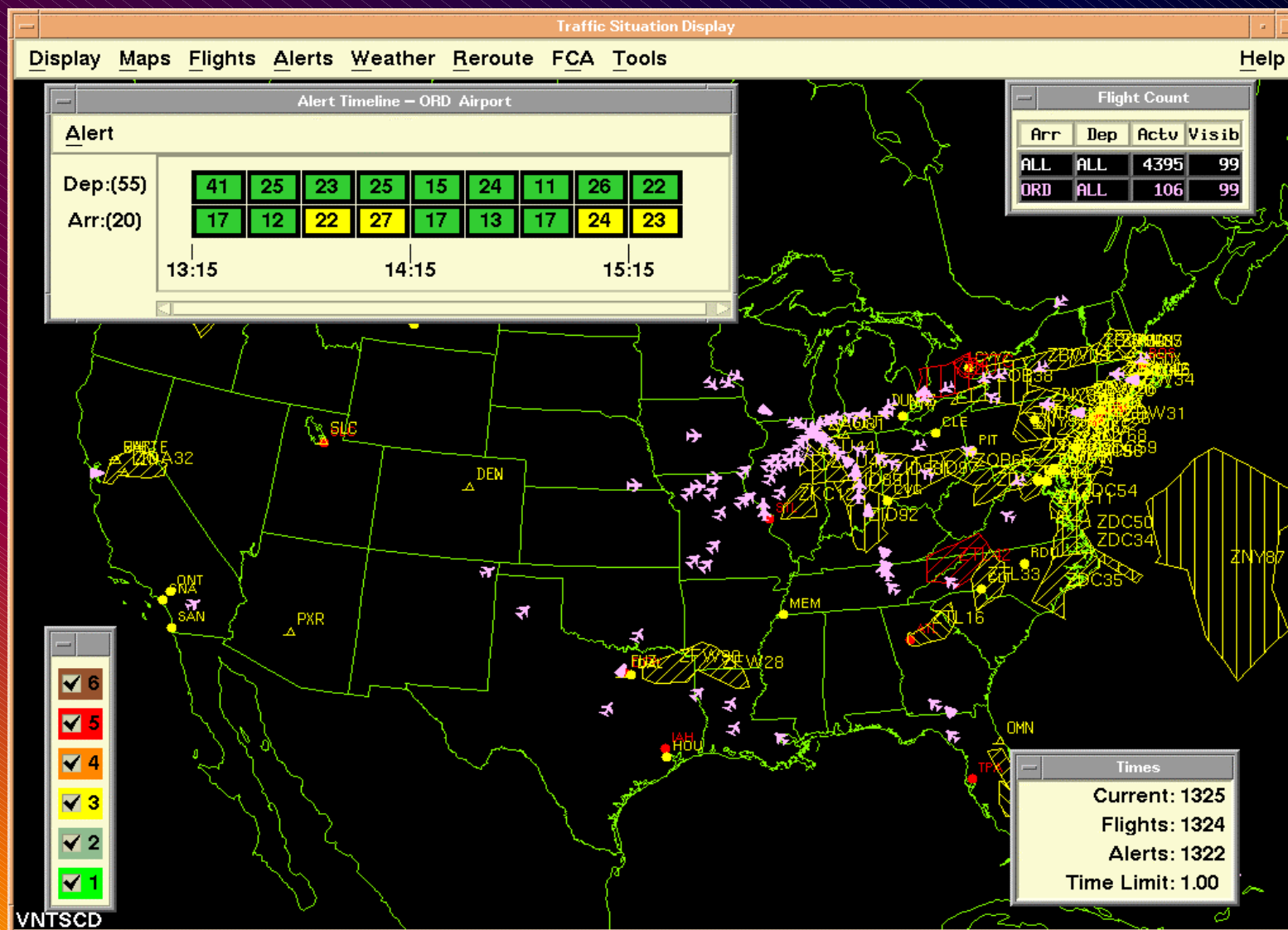
# *Improved Congestion Management*

- Congestion Management Tools
  - Monitor Alert
    - = Calculates and displays expected number of aircraft in a specific airspace against capacity thresholds
    - = Predicts congestion at airports or sectors up to four hours in advance

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# Monitor Alert







## ***Improved Congestion Management***

- Congestion Management Tools (Cont'd)
  - Common Constraint Situation Display (CCSD)
  - Route Management Tool (RMT)
  - Collaborative Routing Coordination Tool (CRCT)
  - Pathfinder Web Page (PFWP)
  - Reroute Programs



# System Impact Assessment

- Provides “What-If” real-time decision support to mitigate the impact of a proposed TFM initiative

Real-Time FSA - Netscape

File Edit View Go Communicate Help

Back Forward Reload Home Search Netscape Print Security Shop Stop

Real-Time FSA

What's New Operations Automation Information Procedures Training QA

ORD Time Out Delay Sorted By ETA

Flight list generated at 1731z on 7/26/2002

\* An asterisk indicates the flight has not yet departed

Hour	Flight	Origin	Destination	CTD	CTA	ETA	Minutes in TSD	Cancel Status
2200	DAL850*	ZBAA	ZPA	26/1114	26/2346	26/2255	90	TO cancelled at 26/1615
2000	DAL896*	VHHH	ZPA	26/0501	26/1901	26/2031	90	TO cancelled at 26/1615
1900	BAX390	CVQ	ZID	26/1714	26/1814	26/1910	5	
	HP162*	CYWG	CZW	-	-	26/1907	5	
	DAL617*	DCA	ZDC	26/1716	26/1849	26/1903	10	
1800	DLR865*	CAE	ZOB	26/1714	26/1817	26/1832	15	
	NWA173*	DTW	ZOB	26/1714	26/1800	26/1815	15	
	BSP212*	IND	ZID	26/1714	26/1759	26/1810	2	
	DLR358*	MLI	ZAU	26/1712	26/1806	26/1801	15	
1700	AZ656*	LDMC	ZEU	26/0825	26/1808	26/1757	10	TO cancelled at 26/1615
	DLR469*	BNA	ZME	26/1559	26/1719	26/1741	5	TO cancelled at 26/1656
	SLA793*	DFW	ZFW	26/1540	26/1740	26/1739	10	TO cancelled at 26/1546

Connect Host LTASCHC contacted. Waiting for reply...



# ***System Impact Assessment***

## System Impact Tools

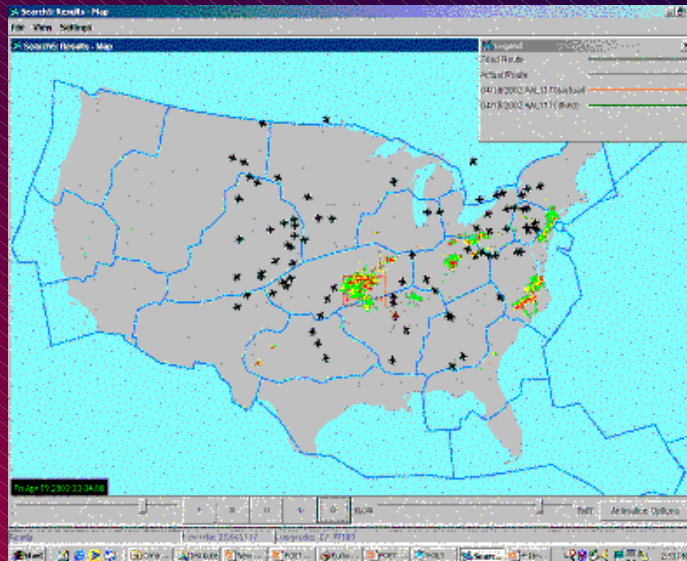
- Flow Constraint Area (FCA)
- Flow Evaluation Area (FEA)
- Real-Time FSA
- FSM Power Run





# Performance Assessment

- Provides near-real time post-operational data analysis capabilities





# ***Performance Assessment***

## Performance Assessment Tools

- FSA
- Post-Operational Evaluation Tool (POET)



## ***TFM Program Status***

- R&D activities are in various stages of maturity
- TFM has a planned spiral evolution of products that move from R&D to Development to Maintenance over their lifecycle
- ETMS 7.6 expected to be in place for DCP kick-off
- During acquisition process, TFM will continue to evolve. Production contractor will need to incorporate baseline changes after contract start into the final delivered baseline.





## ***TFM Information Pipeline***

- Government Furnished Information
  - Final Functional Audit Report
  - ETMS Software Analysis Report
  - ETMS Functional Description
  - Xxxx
  - Xxxx
  - Xxxx
  - xxxxx
- Training
  - TFM Modernization Workshop
  - ETMS CBI